PAPERS

IN

MECHANICS.

No. I.

SYPHON FOR WATERING SHIPS.

The GOLD ISIS MEDAL *was voted to W.* RODGER, *Esq. Lieut. R.N. for his Syphon for Watering Ships; a Drawing of which is in the Society's Repository.*

1, *Upper Gloucester Place, King's Road,*
SIR, *Chelsea, 25th March,* 1829.

FOR the inspection of the Society for the Encouragement of Arts, &c. I have herewith the pleasure to transmit the plan of a syphon of my invention, for the purpose of watering ships, by means of tank vessels, which carry the water alongside in bulk.

Tank vessels have long been in use at Jamaica and elsewhere; but, until the year 1817, the only method which they had for conveying the water out of them into the casks or iron tanks in the ship's hold, was by pumping or baling; both of which were found to be tedious, and in a warm climate extremely laborious, and

tending greatly to injure the health of the crew by exposure to the sun. To obviate this defect in the watering of His Majesty's ships, I, in the month of November 1816, submitted my plan to my Lords Commissioners of the Admiralty, who were pleased to order one to be constructed in H. M. yard at Portsmouth, under my superintendence. From that period till the latter end of 1818, I was almost constantly employed with this useful instrument, which I at length succeeded in getting adopted at Plymouth, where it has been in use ever since; and from the correspondence which I have recently had with the Victualling Board on the subject, I have reason to believe that ere long it will be in use at all the principal ports frequented by His Majesty's ships. With regard to its capability of action and the extent to which it may be carried, I beg to refer the Society to the accompanying certificates, which I had the honour to receive from officers of the first distinction, who witnessed my experiments, and whose testimony I feel confident will be deemed highly satisfactory. As the principle of the syphon, however, is so well understood, I have not considered it necessary to construct a model for the purpose of illustration; but should the Society think my plan worthy of insertion in their Transactions, I shall have much pleasure in furnishing working drawings for their Repository. In the mean time I beg to express a hope that the accompanying drawings and explanatory references will make the peculiarities of my plan sufficiently clear to enable the Society to form a judgment of its merits. I shall not, therefore, trespass on your time by entering into any explanation at present; but shall be most happy to wait on the Committee for the purpose of giving them any information which they

may require relative to the practical application of the plan.

I am, Sir, &c. &c.

A. Aikin, Esq.
Secretary, &c. &c.

William Rodger,
Lieut. R.N.

References to the Engraving. Plate VI.

Fig. 1, section of a ship and tank vessel, to a scale of about one-twelfth of an inch to a foot; A the fresh water; BB C DD E FF G and H the different lengths which compose the syphon; they are screwed together by union joints; its lower end H turns up into the cistern I. JJ four delivering hoses to convey the water from the cistern into the tanks KK, and afterwards to the casks LL; the sloping part of the syphon C D and E is supported on a sort of ladder M, of 18, 12, and 6 feet lengths, jointed together at N, by which it adapts itself to different-sized ships: this is slung to the ship by ropes OOO and P; its inner end rests on the combings of the hatchway; the bottom of the syphon H may rest on the tanks, or be supported from the hatchway by ropes, Q, which are used to let it down. The ascending lengths BB are supported by a rope R from the ladder; this relieves the joints and curved part of C from its weight; thus the syphon is entirely supported by the ship and moves with it; therefore, to prevent the differing motions of the vessels from deranging the syphon, the receiving lengths BB are made of flexible hose, and the lowest end is held by a rope S, which causes it to swing aside like a pendulum, instead of striking the bottom of the tank when the vessels move. The other figures are all one-

twelfth of the real size, the middle parts being broken away to contract them within the compass of a drawing. Fig. 2 is the syphon, partly in section to shew its construction. Fig. 3, a horizontal section of the cistern I. The syphon has a valve at each end, which enables it to be filled at top after it is fixed as in fig. 1. The receiving valve at the bottom of B shuts by its own weight, and is guarded by a perforated cap T; the other valve in the cistern I is shut by turning the screw U; water is then poured into the syphon by the funnel V till it and the funnel are quite full; the cap is then screwed on air-tight, and it becomes an air vessel to receive whatever air might lodge in the syphon or be discharged from the water, and thus secures its action; the cistern-valve is then opened by its screw U. The water immediately flows into the cistern and runs through the hoses into the tanks, the air from the hoses and cistern escapes through the tube W, which rises 7 feet above the cistern, and is covered by a perforated cap. The syphon is provided with three lengths of receiving flexible hose BB, two of 6 feet and one of 3 feet; they connect by union joints XX: these hoses are kept distended by spiral copper wire, and, where the joints are tied in, short pieces of copper tube YY are inserted partly in the joint and partly in the spiral to connect them; they are covered with parcelling* and then with canvass, which protects them and keeps them air-tight. The other lengths are made of copper tube, cased in elm $\frac{3}{4}$ thick, having bands of plumbers' solder ZZ run round, which binds very tight: the wood

* The parcelling must be previously saturated with a composition of bees'-wax, tallow, and rosin.

ends of each length are dove-tailed under the solder bands *aa*, and the brass joints have recesses around them, into which the solder enters and binds them tight together: the copper tube also passes through its portion of the joint, and is spread out over the edge to prevent its coming off. The bottom of the air or filling vessel is a brass tube, into which the copper tubes enter, and are secured by small bands of solder *bb*. The straight tubes of the syphon are $2\frac{1}{2}$ bore, the curved parts $2\frac{3}{4}$, and the flexible hose 3 inches, to allow of its bending, and yet keep sufficient water way; the delivering hose is also $2\frac{1}{2}$ bore, yet the syphon can supply them all with water; the weight of the descending column increasing its velocity so much, there being no pressure on the hose but what occurs from the extra supply rising in the tube W, which is, therefore, called a pressure tube. Two of the hose are 40 feet and two 20 feet, in lengths of 10 feet each, which may be shifted at pleasure; the pieces *cc* of the cistern into which they screw incline downwards, as shewn separate in fig. 4. The brass jets *d* at the extreme ends are curved downward and screw into the hose; they are contracted to two inches for entering the bung-holes of casks and leave room for the air to pass: all the hose screws are of the same size, so that any length may be taken, and it fits right. When all the hoses are not wanted, caps may be screwed into the spare holes of the cistern, the water then rises in the tube W, and causes the remaining hose to deliver so much quicker. On removing a hose from one tank or cask to another, it is only requisite to raise its end a little above the cistern, and it stops running till lowered again. The syphon may be stopped running when requisite by screwing down the cistern-valve U. Two clamps *ee* support the tube W by

holding it to the syphon tube G, and these being always used are never taken apart or from the cistern. Fig. 5, a clamp separate. *ff*, fig. 3, two eyes on the cistern to which the ropes Q are fastened to let it down.

Figs. 6 and 7, top and side views of the ladder M; NN bolts which go through the lower joints, and are secured by fore-locks *gg*. Short pins *hh* secure the upper joints. PP the bridle rope which supports the end of the ladder, it is long enough to pass over the curved end C and funnel V when laid on the ladder, the ropes OO spreading laterally to fix the ladder steady. The turned-up end H is of great use, as it forms a water-joint, so that no motion of the ship can throw a gulp of air into the syphon and stop its running; and should any motion project the water back, the receiving-valve would drop and stop it before the tube H could be empty enough to let air pass; thus the constant action of the syphon is secured as long as the two vessels can be kept together. The length C is 12 feet, and always used; the shifting lengths DD are 4 and 8 feet: the tank vessel is also provided with others, 2, 3, 5, and 6 feet long, to adapt to any sized ship: the elbow-piece E is 8 feet, and is always used; FF shifting pieces of 3 and 5 feet; G is 8 feet, and always used: the union joints are all of the same size, so that the shifting pieces fit any where. The syphon and every thing requisite for its use is stowed in the tank vessel.

1, *Upper Gloucester Place, King's Road,*
SIR, *Chelsea, April* 3, 1829.

In addition to the explanatory references affixed to the drawing of the syphon, which I had the pleasure of

transmitting to you on the 25th ult., I beg leave to subjoin, for the further information of the Society, a few observations relative thereto. In the first place, it is to be understood that the syphon belongs to the tank vessels, on board of which there are two lockers (one on each side of the quarter-deck) for the purpose of containing it and the supporting ladder when not in use. The lockers are only 16 feet long and about 14 inches square, by which it will be perceived that they are no sort of inconvenience. When the tank vessel gets alongside of a ship wanting water, the first thing to be done is to hand on board the delivering hoses, and then the cistern with the 8 feet length and pressure-tube attached to it. These are never unscrewed, as they are wanted in watering every class of vessels. When the depth of the hold exceeds 8 feet, the vertical or long leg of the syphon may be lengthened by the pieces of 2, 3, 4, 5, and 6 feet in length; and had better be done in the tank vessel, as the length required can be at once ascertained by a measuring rod, furnished for that purpose. The ladder for supporting the horizontal part of the syphon should then be handed on board — in a ship of the line through the lower deck port, and in a frigate through the main deck port, abreast of the fore or the main hatchway, according to circumstances,— the one end of the ladder resting on the combings of the hatchway, and the other projecting beyond the ship's side, so as to plumb the hatchway of the tank vessel; the horizontal part of the syphon is placed thereon, and connected with the vertical part in the hatchway. The outer end of the ladder is then elevated as high as the upper part of the port will allow, by means of two topping lifts attached thereto. The suction hoses are next to be screwed on to that part

of the pipe which contains the filling place. Both ends of the instrument being now stopt, the one by means of the self-acting valve at the end of the suction hose, and the other by the screw valve in the bottom of the delivering cistern, the air is expelled by filling it with water, and the cap is screwed on to the filling place. I must here observe that, as the spiral in the suction hose forms a number of cavities which are liable to confine the air, it is necessary, in order completely to expel it, to draw the hose in a horizontal direction from one side of the hatchway to the other, which enables it to escape alternately from all sides. This may also be effected by lowering the suction hose into the tank, and thereby filling it before it is screwed on to the other part of the instrument. To prevent the suction hoses from becoming leaky, it is advisable to coat them with a composition of bees'-wax, tallow, and a little rosin; then parcel them with stout linen or calico, dipped in the same composition, over which a layer of dry canvass parcelling may be put and closely marled down; and to give the hose a neat appearance, a piece of stout canvass may be sewed over all. I need scarcely observe, that the contraction of the canvass when wet, counteracts the expansion of the hose, by the outward pressure of the water in the act of filling, and thereby prevents the stitches from being broken; it also preserves the leather from being injured by exposure to the sun in a warm climate. To prevent the strainer, in the end of the suction hose, from striking the bottom of the tank when the ship has much motion, it should be suspended by means of a small rope made fast to the combings of the hatchway, so as to keep it a few inches from the bottom. By the motion of the ship and tank vessel it will be observed

there is as much gained as lost, and the syphon will continue to run so long as the water in the tank vessel does not fall below the level of the delivering cistern, which rests upon the iron tanks or casks in the ship's hold. In ships of the line and frigates the difference of level will vary from three to twelve feet; and in the smallest class of vessels in His Majesty's service from about two to three feet and a half. I have now only to remark, that the copper pipe is tinned inside to prevent the accumulation of verdigrise; and, in order that it may not be injured, it is cased with elm $\frac{3}{4}$ of an inch thick, and secured by means of solder hoops, run on in a state of fusion. In watering brigs and small vessels, the syphon is led over all. Should any farther information be required, I shall have much pleasure in furnishing it.

I am, Sir, &c, &c.

A. AIKIN, Esq.
Secretary, &c. &c.

WILLIAM RODGER,
Lieut. R.N.

CERTIFICATES.

This is to certify that I witnessed the experiment of Lieutenant Rodger's Syphon for Watering Ships, which was made on board the Queen Charlotte, the 18th of November; and I consider the application of it of great use where tank vessels can be employed in watering His Majesty's ships.

The syphon will fill water at the rate of thirty tons an hour without any manual labour: it is a simple machine, and may be rigged in less than a quarter of an hour, and unrigged in the same space of time.

This machine would be particularly useful in filling water in rivers.

Given under my hand this 21st day of November, 1818.

(Signed) THOMAS BRIGGS,
Captain H.M.S. Queen Charlotte.

These are to certify that I was present at the trial that was made of the syphon invented by Lieut. Rodger, R.N. for the purpose of conveying water from a tank vessel alongside of a ship into tanks, or casks, in a ship's hold. The experiment was made on board His Majesty's ship Queen Charlotte, in Portsmouth Harbour, on the 18th of November, 1818, and appeared to answer the intention most perfectly, by delivering water from four hoses attached to the cistern of the syphon, in the proportion of about thirty tons an hour. The syphon may be prepared in a quarter of an hour, and its general application, where tank vessels can be used, will be a saving of very great manual labour and nearly half the proportion of time, as it does away the expense and use of pumps, and wear and tear of water casks; and two syphons, if necessary, may be used at the same time. I think the trial should be made alongside a brig or frigate at Spithead or anchorage, where there may be motion in both vessels, and where the fall of water from the lower end of the syphon is not so great; and if it should succeed there as well as it did in the Queen Charlotte, it will remove any doubt or objection to its general utility.

Given on board H.M.S. Ramillies, this 21st November, 1818.

(Signed) A. P. HOLLIS,
Captain.

I was present at the experiment made on board H.M. ship Queen Charlotte, in Portsmouth Harbour, on the 18th instant, on Lieut. William Rodger's machine for delivering water from a tank vessel into casks and tanks in the hold of a ship. With all the hoses in one tank, the tank was filled in three minutes and forty seconds, which is at the rate of about thirty tons in an hour. I consider it a most useful invention wherever tank vessels are used for the purpose of watering ships, more especially in a hot climate, as there is a great saving of bodily labour to the crew, and the generality of water delivered is much greater than by the methods now in use.

Given on board H.M.S. Vengeur, November 20, 1818.

(Signed) FREDERICK L. MAITLAND,
Captain of H.M.S. Vengeur.

This is to certify that we were present at the trial made on board the Queen Charlotte, the 18th November, 1818, of Lieutenant Rodger's Syphon for Watering Ships from a tank vessel alongside into tanks or casks in a ship's hold, which appeared to answer the intention in a perfect manner. The syphon fills thirty tons of water in an hour, can be prepared in a quarter of an hour, but probably in less time when the application has been witnessed by the carpenter and his crew. It can be worked any time, day or night, almost without manual labour: the saving in wear and tear of casks must be great; and could a man-of-war get into a river, it would be invaluable: transports might then be substituted. Its construction is simple, and it can easily be stowed away without being liable to damage. It fills four tanks or casks at a time, and the four hoses put into one tank filled it in

three minutes and forty seconds. It bids fair to be a valuable instrument in His Majesty's service, and we cannot but in justice strongly recommend it.

(Signed) GEORGE CHARLES BLAKE,
First Lieutenant.
LEWIS JOHN,
Queen Charlotte, Nov. 18, 1818. *Master.*

These are to certify that I was present on board His Majesty's ship Impregnable, on the 30th November, 1818, when a trial was made for conveying water into the hold of the said ship from a tank vessel alongside, by means of a syphon invented by Lieutenant Rodger, of the Royal Navy; and I am of opinion that it answered in every respect, and will be found of great advantage to the service, if generally adopted.

Given under my hand, at Plymouth, this 1st day of December, 1818.

(Signed) T. M. HARDY,
Captain R.N.

This is to certify, that I attended on board H.M.S. Impregnable, at Plymouth, at an experiment made in the presence of the Commander-in-Chief and other officers, to ascertain the utility of the syphon, as applied to the purpose of filling ships' water casks in the hold without any manual labour, a plan which has been ingeniously brought to its present state of efficiency by Lieutenant Rodger, of the Royal Navy. The syphon filled in the hold of the Impregnable at the rate of *twenty-seven tons and a half* per hour; and had the casks been in the ground or lower tier, in lieu of the upper, by which the

fall would have been increased, it would certainly, without any difficulty, have filled *thirty tons in the hour*. The placing and fitting the machine for use occupies about twenty minutes, or less when the people are accustomed to the manner of fixing it. I have no hesitation in stating my opinion and conviction of its utility, both from the quantity of water which it conveys into the ship in a short time, and the saving of labour; and I think no port where tanks are in use should be in future without Lieut. Rodger's syphon, who deserves, in my opinion, much credit for his perseverance and ingenuity, in bringing forward and perfecting this very useful machine.

Given on board H.M.S. Révolutionnaire, Hamoaze, this 9th of December, 1818.

(Signed) FLEETWOOD PELLEW,
Captain R.N.

These are to certify, that I witnessed the trial of the syphon for filling water (invented by Lieut. Rodger) on board the Impregnable, in Hamoaze, on the 30th November, 1818: it filled at the rate of 27½ tons per hour in the middle tier, without any manual labour whatever: and I consider it to be an excellent plan, in all cases where water is taken alongside in tanks, particularly in a warm climate: at Jamaica, for instance, where all water is (or used to be) supplied in tanks, the doing away with the labour at the pumps would be of the greatest importance.

Given on board the Spartan, Plymouth Sound, 1st December, 1818.

(Signed) W. F. WISE,
Captain.

These are to certify, that I have this day been present at the trial of Lieut. Rodger's new syphon, on board of His Majesty's ship Impregnable. I think this admirable invention well calculated for watering His Majesty's ships: it will save much labour, which is of the greatest consequence in fitting out ships of war, where the men are much wanted in rigging, victualling, and storing the ships for sea. The syphon will be very useful in newly commissioned ships, where they have but few men, and those required for other work. It appears it will take twelve able men three hours' hard work to pump out a tank of fifty tons. The syphon will discharge the same quantity of water in less than two hours without any men.

(Signed) JOHN GAZE,
November 30, 1818. *Master of H.M.S. Impregnable.*

No. II.

MAKE-SHIFT ANCHOR.

The LARGE SILVER MEDAL *was presented to W.* RODGER, *Esq., Lieutenant R.N., for his Make-shift Anchor; a Model of which has been placed in the Society's Repository.*

1, *Upper Gloucester Place, King's Road,*
SIR, *Chelsea, April* 8, 1829.

HAVING several years ago invented a substitute for an anchor, which might probably before this have been of some service to the public had it been generally known, I have now the pleasure of transmitting a model thereof